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OIPE IAP78 FEB 1 9 2008 PATENT & TRADEMARK OFFICE

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	10/782,953
Filing Date	02/23/2004
First Named Inventor	Erik J. Shahoian
Art Unit	2629
Examiner Name	Lao, Lun Yi
Attorney Docket Number	IMMR-0097B (034701-014)
Total Number of Pages in This Submission	25

ENCLOSURES (check all that apply)

- [x] Fee Transmittal Form
  - [ ] Fee Attached
- [ ] Amendment / Reply
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [ ] Reply to Missing Parts/ Incomplete Application
  - [ ] Reply to Missing Parts under 37 CFR1.52 or 1.53
- [ ] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert to a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s) _____
  - [ ] Landscape Table on CD
- [ ] After Allowance Communication to TC
- [ ] Appeal Communication to Board of Appeals and Interferences
- [ ] Appeal Communication to TC (Appeal Notice, Brief, Reply Brief)
- [ ] Proprietary Information
- [ ] Status Letter
- [x] Other Enclosure(s) (please identify below):

Postcard, Appeal Brief (23 pgs.)

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	Thelen Reid Brown Raysman & Steiner LLP		
Signature	[signature]		
Printed Name	Khaled Shami		
Date	02/13/2008	Reg. No.	38,745

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Signature	Julie Arango		
Typed or printed name	Julie Arango	Date	02/13/2008

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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PTO/SB/17 (10-07)
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FEE TRANSMITTAL for FY 2008

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 510.00

Complete if Known	
Application Number	10/782,953
Filing Date	02/23/2004
First Named Inventor	Erik J. Shahoian
Examiner Name	Lao, Lun Yi
Art Unit	2629
Attorney Docket No.	IMMR-0097B (034701-014)

METHOD OF PAYMENT (check all that apply)

☐ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify) : ______

☒ Deposit Account Deposit Account Number: 50-1698 Deposit Account Name: Thelen Reid Brown Raysman & Steiner LLP

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

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FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

	FILING FEES		SEARCH FEES		EXAMINATION FEES		
		Small Entity		Small Entity		Small Entity	
Application Type	Fee ($)	Fee($)	Fee($)	Fee($)	Fee($)	Fee($)	Fees Paid ($)
Utility	310	155	510	255	210	105	____
Design	210	105	100	50	130	65	____
Plant	210	105	310	155	160	80	____
Reissue	310	155	510	255	620	310	____
Provisional	210	105	0	0	0	0	____

2. EXCESS CLAIM FEES

Fee Description	Fee ($)	Small Entity Fee ($)
Each claim over 20 (including Reissues)	50	25
Each independent claim over 3 (including Reissues)	210	105
Multiple dependent claims	370	185

Total Claims **Extra Claims** **Fee($)** **Fee Paid ($)**

____ -20 or HP= ____ x ____ = ____

HP = highest number of total claims paid for, if greater than 20.

Multiple Dependent Claims
Fee ($) **Fee Paid ($)**
____ ____

Indep. Claims **Extra Claims** **Fee($)** **Fee Paid ($)**

____ - 3 or HP= ____ x ____ = ____

HP = highest number of independent claims paid for, if greater than 3.

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets **Extra Sheets** **Number of each additional 50 or fraction thereof** **Fee ($)** **Fee Paid ($)**

____ - 100 = ____ / 50 = ____ (round up to a whole number) x ____ = ____

4. OTHER FEE(S) **Fees Paid ($)**

Non-English Specification, $130 fee (no small entity discount) ____

Other (e.g., late filing surcharge) : Filing a brief in support of an appeal 510.00

SUBMITTED BY

Signature	[signature]	Registration No. (Attorney/Agent)	38,745	Telephone	408-292-5800
Name (Print/Type)	Khaled Shami			Date	02/13/2008

This collection of information is required by 37 CFR 1.136. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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OIPE IAP78
FEB 19 2008
PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: Erik J. Shahoian CONFIRMATION NO.: 7553

SERIAL NO.: 10/782,953

FILING DATE: 02/23/2004

TITLE: HAPTIC INTERFACE DEVICE AND ACTUATOR ASSEMBLY PROVIDING LINEAR HAPTIC SENSATIONS

EXAMINER: Lao, Lun Yi

ART UNIT: 2629

CERTIFICATE OF MAILING

I hereby certify that this paper is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: Mail Stop Appeal Brief - Patents, Commissioner for Patents, P.O. Box 1450, Alexandria VA 22313-1450, on the date printed below:

Date: 02/13/2008 Name: Julie Arango
Julie Arango

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Dear Sir:

This paper is in support of a Notice to Appeal filed December 17, 2007, of the Office Action dated September 13, 2007, to the Board of Patent Appeals and Interferences.

02/19/2008 CCHAU1 00000047 501698 10782953
01 FC:1402 510.00 DA

TABLE OF CONTENTS

REAL PARTY IN INTEREST

Immersion Corporation.

RELATED APPEALS AND INTERFERENCES

None.

STATUS OF CLAIMS

Claims 1-66 have been canceled.

Claims 67-109 have been finally rejected and are on appeal.

STATUS OF AMENDMENTS

No amendments after final have been filed. All amendments have been entered.

Summary of Claimed Subject Matter

The invention relates to haptic feedback devices, in which a haptic, or tactile sensation is output by a device to a user under certain conditions. The device may for example be a computer mouse or similar pointing device. The haptic force is provided by an actuator that is mechanically coupled to the device and that is prompted to for example vibrate based on a sensed condition, such the particular location or movement of the mouse. While myriad actuators are available for this purpose, it is important in many consumer applications that the cost of the actuator be kept to a minimum. The inventive design is particularly well-suited for such low cost applications.

Claim 67 is directed to a device (mouse 40, FIG. 2, p. 11, l. 11) comprising a sensor (52, FIG. 2, p. 11, l. 11) configured to output a sensor signal associated with one of a movement and a position (FIG. 1, p. 8, l. 29 – p. 9, l. 5) of a housing (50, FIG. 2, p. 11, l. 11) to which the sensor is coupled. The device also comprises an actuator (66, FIG. 2, p. 12, l. 20) coupled to the housing (p. 14, ll. 25-26), the actuator being configured to output a rotary force (p. 14, ll. 9-15) based on a haptic feedback signal received from a processor (510, FIG. 13, p. 34, ll. 19-20), the haptic feedback signal being based on the sensor signal (510, FIG. 13, p. 34, ll. 19-20). The device also comprises a flexure (68, 80, FIGS. 3a-3c, p. 16, ll. 19-20) having a plurality of flexible joints (94, 98a, 98b, 102a, 102b, FIGS. 3a-3c, p. 17, ll. 1-16), the flexure being coupled to the actuator (p. 16, l. 28) and the housing (p. 16, ll. 28-30), the flexure being configured to translate the rotary force to a linear motion of the flexure (arrow 106, FIG. 3c, p. 17, ll. 25-28), the flexure operative to output haptic feedback based on the rotary force (p. 18, ll. 9-15).

Claim 89 relates to a device (mouse 40, FIG. 2, p. 11, l. 11) comprising a housing (50, FIG. 2, p. 11, l. 11), a sensor (52, FIG. 2, p. 11, l. 11) coupled to the housing, the sensor configured to output a sensor signal associated with one of a movement and a position of the housing (FIG. 1, p. 8, l. 29 – p. 9, l. 5), an actuator assembly (flexure 150, actuator 170, FIGS. 5a-5c, p. 20, l. 32, p. 21, l. 17) including a stationary portion (170, FIGS. 5a-5c, p. 21, l. 17) that is mounted to the housing (176, 50, FIGS. 5a-5c, p. 21, l. 23) and an actuator portion (172, 152 FIGS. 5a-5c, p. 21, l. 19) that is movable with respect to the housing in response to said sensor

signal (510, FIG. 13, p. 34, ll. 19-20), and a mechanism including a flexure (150, FIGS. 5a-5c, p. 21, l. 32) having at least a first flex joint and a second flex joint (154, 158, 164a, 164b, FIGS. 5a-5c, p. 21, l. 2, l. 4, l. 6, l. 8), the mechanism configured to couple the actuator portion of the actuator assembly to the housing such that movement of the actuator portion operates to provide haptic feedback to the housing in the form of an inertial force that is transferred to the housing by way of the stationary portion of the actuator assembly.

Claim 100 relates to a method that includes generating a sensor signal associated with one of a movement and a position (p. 11, l. 15) of an interface device (mouse 40, FIG. 2, p. 11, l. 11), and imparting haptic feedback (p. 12, ll. 25-28) to a housing (50, FIG. 2, p. 11, l. 11) of the interface device by way of an actuator assembly (flexure 150, actuator 170, FIGS. 5a-5c, p. 20, l. 32, p. 21, l. 17) having a stationary portion (170, FIGS. 5a-5c, p. 21, l. 17) that is rigidly mounted to the housing and a movable actuator portion (172, 152 FIGS. 5a-5c, p. 21, l. 19) that is movable with respect to the housing in response to the sensor signal, the movable actuator portion being coupled to the housing by way of a flexure (150, FIGS. 5a-5c, p. 21, l. 32) having at least one flex joint (154, 158, 164a, 164b, FIGS. 5a-5c, p. 21, l. 2, l. 4, l. 6, l. 8).

Claim 105 relates to an apparatus configured to be coupled to an interface device (mouse 40, FIG. 2, p. 11, l. 11) to thereby provide haptic feedback (p. 12, ll. 25-28) to the interface device in response to a control signal, the apparatus comprising an actuator (170, FIGS. 5a-5c, p. 21, l. 17) having an actuator mass, an actuator housing and a rotating shaft (172, 152 FIGS. 5a-5c, p. 21, l. 19), and a flexure mechanism (150, FIGS. 5a-5c, p. 21, l. 32) coupling the actuator housing to the interface device by way of at least one flex joint (154, 158, 164a, 164b, FIGS. 5a-5c, p. 21, l. 2, l. 4, l. 6, l. 8) enabling relative motion between the actuator and the interface device in response to rotation of the rotating shaft caused by said control signal, said relative motion imparting an inertial force to the interface device to thereby provide said haptic feedback.

Grounds of Rejection to be Reviewed on Appeal

Whether claims 67-72 and 78-109 are anticipated under 35 U.S.C. 102(e) by U.S. Pat. No. 6,211,861 (Rosenberg; hereinafter, "Rosenberg '861").

Whether claims 67-109 are anticipated under 35 U.S.C. 102(e) by U.S. Pat. No. 6,184,868 (Shahoian et al.; hereinafter, "Shahoian").

Whether claims 67-85 and 89-109 are unpatentable under 35 U.S.C. 103(a) over U.S. Pat. No. 6,985,133 (Rodomista et al.; hereinafter, "Rodomista") in view of U.S. Pat. No. 5,701,140 (Rosenberg et al.; hereinafter, "Rosenberg '140").

ARGUMENT

Rejection of Claims 67-72 and 78-109 Under 35 U.S.C. 102(e) Based on Rosenberg '861

Claims 67-72 and 78-109

Claim 67 recites, *inter alia*, an actuator outputting a rotary force, and "a flexure having a plurality of flexible joints, … the flexure being configured to translate the rotary force to linear motion of the flexure." Claim 89 recites, *inter alia*, "a flexure having at least a first flex joint and a second flex joint." Claim 100 recites, *inter alia*, a "movable actuator portion [that is] coupled to [a] housing by way of a flexure having at least one flex joint." Claim 105 recites, inter alia, "a flexure mechanism coupling [an] actuator housing to [an] interface device by way of at least one flex joint."

These recited features are not disclosed in Rosenberg '861. In the configuration of FIG. 3B of Rosenberg '861, spinning shaft 72 of actuator 70 is rigidly attached to arm 73, and rotation of the shaft 70 causes rotation of inertial mass 74 in the direction of arrows 75. No flexure having a plurality of flexible joints is disclosed or discussed in this or any other portion of Rosenberg '861.

The contention that shaft 72 of Rosenberg '861 comprises a flexure (Final Office Action, ¶2, l. 11) is untenable. The term "flexure" is clearly defined and illustrated in appellants' disclosure and its use by appellants is fully consistent with its ordinary and accustomed meaning. In the discussion of appellants' FIGS. 3a-3c, for example, it is stated that "the flexure is preferably a single, unitary piece … ('living hinge' material) or other flexible material" (p. 16, ll. 20-22); "The flex joint 94 preferably is made very thin in the dimension it is to flex…so that the flex joint 94 will bend when the moving portion 88 is moved with respect to the grounded portion 86" (p. 17, ll. 1-4); "Like flex joint 94, the flex joint 98a, 98b, 102a and 102b are thin in one of the x-y dimensions … to allow motion between the two members connected by each flex joint" (p. 17, ll. 12-14). In Rosenberg '861, by comparison, shafts 72 and arm 73 of Rosenberg '861 are rigidly coupled to one another and exhibit no bending.

It will be appreciated that, according to the M.P.E.P., a claim is anticipated under 35 U.S.C. §102 only if each and every claim element is found, either expressly or inherently described, in a single prior art reference.[1] The aforementioned reasons clearly indicate the contrary, and the 35 U.S.C. §102(e) rejection of claims 67, 89, 100 and 105, and of the remaining claims variously dependent therefrom, based on Rosenberg '861, is therefore improper and should be withdrawn.

Rejection of Claims 67-109 Under 35 U.S.C. 102(e) Based on Shahoian

Claims 67-109

Claim 67 recites, *inter alia*, an actuator outputting a rotary force, and "a flexure having a plurality of flexible joints, ... the flexure being configured to translate the rotary force to linear motion of the flexure." Claim 89 recites, *inter alia*, "a flexure having at least a first flex joint and a second flex joint." Claim 100 recites, *inter alia*, a "movable actuator portion [that is] coupled to [a] housing by way of a flexure having at least one flex joint." Claim 105 recites, inter alia, "a flexure mechanism coupling [an] actuator housing to [an] interface device by way of at least one flex joint."

These recited features are not disclosed in Shahoian. Joints 132a, 132b, shown in FIGS. 5A-B, are "ground pivot points" through which gripper members 130a and 130b respectively rotate. There is no mention of a flexure-type arrangement in the manner described and claimed in the instant application. Items 134a, 134b, also shown in FIGS. 5A-B, are rigid link members that are also inconsistent with the flexure-type arrangement described and claimed in appellants application. As previously explained, in the discussion of appellants' FIGS. 3a-3c, for example, it is stated that "the flexure is preferably a single, unitary piece ... ('living hinge' material) or other flexible material" (p. 16, ll. 20-22); "The flex joint 94 preferably is made very thin in the dimension it is to flex...so that the flex joint 94 will bend when the moving portion 88 is moved with respect to the grounded portion 86" (p. 17, ll. 1-4); "Like flex joint 94, the flex joint 98a, 98b, 102a and 102b are thin in one of the x-y dimensions ... to allow motion between the two members connected by each flex joint" (p. 17, ll. 12-14). Items 132a, 132b, 134a and 134b do no

[1] Manual of Patent Examining Procedure (MPEP) § 2131. See also *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

exhibit these properties and do not fit into this definition of "flexure."

Again it will be recalled that, according to the M.P.E.P., a claim is anticipated under 35 U.S.C. §102 only if each and every claim element is found, either expressly or inherently described, in a single prior art reference.[2] The aforementioned reasons clearly indicate the contrary, and the 35 U.S.C. §102(e) rejection of claims 67, 89, 100 and 105, and of the remaining claims variously dependent therefrom, based on Shahoian, is therefore improper and should be withdrawn.

Rejection of Claims 67-85 and 89-109 Under 35 U.S.C. 103(b) Based on Rodmista in View of Rosenberg '140

Claims 67-85 and 89-109

As previously explained, Claim 67 recites, *inter alia*, an actuator outputting a rotary force, and "a flexure having a plurality of flexible joints, ... the flexure being configured to translate the rotary force to linear motion of the flexure." Claim 89 recites, *inter alia*, "a flexure having at least a first flex joint and a second flex joint." Claim 100 recites, *inter alia*, a "movable actuator portion [that is] coupled to [a] housing by way of a flexure having at least one flex joint." Claim 105 recites, inter alia, "a flexure mechanism coupling [an] actuator housing to [an] interface device by way of at least one flex joint."

The Final Office Action equates plastic joints 20, 22 and 34 with the claimed flexures. (¶6, l. 11) However, as clearly explained in Rodomista, plastic joints 20, 22 and 34 are conventional pivot joints that do not exhibit the attendant flexure characteristics recited in the claims and defined in the instant application. In fact, in the passage to which the Final Office Action makes reference, Rodomista explains that movable portions such as third element 22 are "[l]ight weight, low cost, high stiffness and high strength" (col. 12, ll. 50-51), features that are antithetical to the flexure definition relied upon in the application. In addition, Rosenberg '140 does not remedy this shortcoming and its features, even if properly combinable with Rodomista,

[2] Manual of Patent Examining Procedure (MPEP) § 2131. See also *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

would not teach or render obvious the invention as claimed. Accordingly, the obviousness rejection of independent claims 67, 89, 100 and 105, and of the remaining claims variously dependent therefrom, based on the combination of Rodomista and Rosenberg '140, is improper and should be withdrawn.

CLAIMS APPENDIX

67. A device, comprising:

a sensor configured to output a sensor signal associated with one of a movement and a position of a housing to which the sensor is coupled;

an actuator coupled to the housing, the actuator being configured to output a rotary force based on a haptic feedback signal received from a processor, the haptic feedback signal being based on the sensor signal; and

a flexure having a plurality of flexible joints, the flexure being coupled to the actuator and the housing, the flexure being configured to translate the rotary force to a linear motion of the flexure, the flexure operative to output haptic feedback based on the rotary force.

68. The device of claim 67, wherein the linear motion is substantially along an axis perpendicular to a base of the housing, the base being configured to contact a planar support surface.

69. The device of claim 67, wherein the actuator includes an inertial mass, the inertial mass being configured to be moved linearly with the linear motion of the flexure, the haptic feedback including an inertial force.

70. The device of claim 67, wherein a portion of the flexure is coupled to a moveable contact member, the movable contact member being configured to receive user input.

71. The device of claim 67, wherein a portion of the flexure is coupled to a button coupled to the housing, the button configured to receive user input.

72. The device of claim 67, further comprising:

a rotating member coupled to a rotating shaft of the actuator and to at least one flex joint from the plurality of flex joints.

73. The device of claim 67, wherein the flexure includes a first arm member and a second arm member, the first arm member and the second arm member being configured to couple a linear moving portion of the flexure to a stationary portion of the flexure, the first arm member and the second arm member are coupled to the linear moving portion by at least one flex joint from the plurality of flex joints.

74. The device of claim 67, wherein the flexure includes a central member, a first branch member and a second branch member, the central member of the flexure is coupled to a rotating shaft of the actuator, the first branch member and the second branch member arranged in a substantially Y-configuration.

75. The device of claim 67, wherein the flexure includes a central member, a first branch member and a second branch member, the central member of the flexure is coupled to a rotating shaft of the actuator, the first branch member and the second branch member arranged in a substantially Y-configuration, at least one of the flex joints from the plurality of flex joints being disposed on each of the first branch member and the second branch member, at least one flex joint from the plurality of flex joints is disposed on the central member.

76. The device of claim 67, wherein the flexure includes:

a rotating member coupled to the housing by at least one flex joint from the plurality of flex joints, and

a first arm member and a second arm member, the first arm member and the second arm member coupling the actuator to the housing by at least one flex joint from the plurality of flex joints.

77. The device of claim 67, wherein the flexure includes:

a rotating member coupled to the housing by at least one flex joint from the plurality of flex joints, and

a first arm member and a second arm member, the first arm member and the second arm member coupling the actuator to the housing by at least one flex joint from the plurality of flex joints, the rotating member being coupled to the housing by a first flex joint and a second flex

joint from the plurality of flex joints, the actuator being coupled to the housing by the first arm member and the second arm member, the first arm member and the second arm member including at least two of the flex joints from the plurality of flex joints.

78. The device of claim 67, wherein the actuator is driven bi-directionally, the haptic feedback including at least one of a pulse and a vibration.

79. The device of claim 67, wherein the flexure includes at least one stop to prevent motion of a shaft of the actuator past a desired portion of a full revolution.

80. The device of claim 67, wherein the linear motion is associated with a graphical representation displayed by the processor, the sensor signal being associated with a position of a cursor displayed in the graphical representation.

81. The device of claim 67, wherein the haptic feedback includes a pulse associated with a simulated interaction of a cursor with a graphical object displayed in a graphical user interface.

82. The device of claim 67, wherein the haptic feedback includes a pulse associated with a simulated interaction of a cursor with a graphical object displayed in a graphical user interface, the pulse having a magnitude associated with a characteristic of the graphical object.

83. The device of claim 67, wherein the haptic feedback includes a pulse associated with a simulated interaction of a cursor with a graphical object from a plurality of graphical objects displayed in a graphical user interface, the pulse having a magnitude associated with a type of the graphical object from the plurality of the graphical objects.

84. The device of claim 67, wherein the haptic feedback includes a pulse associated with a simulated interaction of a cursor with an item in a graphical menu.

85. The device of claim 67, wherein the haptic feedback includes at least one of a pulse, vibration, and texture force.

86. The device of claim 67, wherein the sensor includes a ball that is configured to frictionally contact a surface over which the housing is movable.

87. The device of claim 67, wherein the sensor is an optical sensor configured to detect a relative movement of the optical sensor with respect to a surface over which the housing is movable.

88. The device of claim 67, wherein the actuator is positioned such that a rotating shaft of the actuator is configured to rotate about an axis substantially orthogonal to a base of the housing.

89. A device, comprising:

a housing;

a sensor coupled to the housing, the sensor configured to output a sensor signal associated with one of a movement and a position of the housing

an actuator assembly including a stationary portion that is mounted to the housing and an actuator portion that is movable with respect to the housing in response to said sensor signal; and

a mechanism including a flexure having at least a first flex joint and a second flex joint, the mechanism configured to couple the actuator portion of the actuator assembly to the housing such that movement of the actuator portion operates to provide haptic feedback to the housing in the form of an inertial force that is transferred to the housing by way of the stationary portion of the actuator assembly.

90. The device of claim 89, wherein the actuator is configured to be moved in approximately a linear motion with respect to the housing.

91. The device of claim 89, wherein actuator is configured to output a rotary force.

92. The device of claim 89, wherein the actuator is configured to be moved in approximately a substantially linear motion, the linear motion being along a z-axis substantially orthogonal to an x-y plane, the device being configured to move in the x-y plane.

93. The device of claim 89, further comprising a contact member, the actuator being coupled to the contact member, the contact member being configured to move with respect to the housing in response to the force output by the actuator, the contact member being further configured to receive an external input force.

94. The device of claim 89, wherein the mechanism includes mechanical rotary bearings.

95. The device of claim 89, wherein the flexure includes:

a rotating member coupled to the housing by at least the first flex joint, and

a first arm member and a second arm member each configured to couple the actuator to the housing by at least the first flex joint.

96. The device of claim 89, wherein the flexure includes at least one stop to prevent rotation of a shaft of the actuator past a desired portion of a full revolution.

97. The device of claim 89, wherein the actuator is configured to move bi-directionally to output at least one of a pulse and a vibration.

98. The device of claim 89, wherein the haptic feedback is associated with a graphical representation displayed by a processor, a position of the housing in a planar workspace being associated with a position of a cursor displayed in the graphical representation.

99. The device of claim 89, wherein the haptic feedback is a pulse associated with the simulated interaction of a cursor with a graphical object displayed in a graphical user interface.

100. A method, comprising:

generating a sensor signal associated with one of a movement and a position of an interface device; and

imparting haptic feedback to a housing of the interface device by way of an actuator assembly having a stationary portion that is rigidly mounted to the housing and a movable

actuator portion that is movable with respect to the housing in response to the sensor signal, the movable actuator portion being coupled to the housing by way of a flexure having at least one flex joint.

101. The method of claim 100, wherein the haptic feedback is associated with a haptic feedback signal received by the interface device from a processor.

102. The method of claim 100, wherein the actuator is moved in approximately a linear motion.

103. The method of claim 100, wherein the haptic feedback output by the actuator is associated with a rotary motion of the actuator.

104. The method of claim 100, wherein the actuator is moved in approximately a linear motion along a z-axis substantially orthogonal to a base of the housing.

105. An apparatus configured to be coupled to an interface device to thereby provide haptic feedback to the interface device in response to a control signal, the apparatus comprising:

an actuator having an actuator mass, an actuator housing and a rotating shaft; and

a flexure mechanism coupling the actuator housing to the interface device by way of at least one flex joint enabling relative motion between the actuator and the interface device in response to rotation of the rotating shaft caused by said control signal, said relative motion imparting an inertial force to the interface device to thereby provide said haptic feedback.

106. The apparatus of claim 105, wherein the actuator moves approximately linearly.

107. The apparatus of claim 105, wherein the inertial force output by the actuator is a rotary force.

108. The apparatus of claim 105, wherein a rotating shaft of the actuator is coupled to a flexure arm including the at least one flex joint, the flexure arm being configured to be coupled

to a portion of the interface device housing, the interface device housing being flexibly coupled to a carriage, the carriage being coupled to the actuator housing.

109. The apparatus of claim 105, wherein the flexure mechanism includes a travel limiter configured to limit the movement of the actuator within a desired range of motion.

EVIDENCE APPENDIX

None.

Related Proceedings Appendix

None.

Please charge any additional required fee or credit any overpayment not otherwise paid or credited to our deposit account No. 50-1698.

Respectfully submitted,
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